

## TEMPERATURE OF THE AIR.

[In degrees Fahrenheit.]

The mean temperature is given for each station in Table II, for voluntary observers. Both the mean temperatures and the departures from the normal are given in Table I for the regular stations of the Weather Bureau.

The *monthly mean temperatures* published in Table I, for the regular stations of the Weather Bureau, are the simple means of all the daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean temperature* of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

The *highest mean temperatures* were: In the United States, Key West, 70.3; Jupiter, 66.0; Los Angeles, 59.0; Yuma, 58.6; Port Eads, 57.7; Corpus Christi, 57.6. The lowest were: Moorhead, 14.6; Northfield, 17.9; Bismarck, 19.0; Williston, 19.6. In Canada the highest were: Esquimaux, 42.6; Spences Bridge, 34.4; Yarmouth, 28.8. The lowest were: White River, 6.0; Battleford, 7.1; Prince Albert, 8.8.

As compared with the normal for December the mean temperature for the current month was in excess from the Appalachian range and west Gulf stations westward to the Pacific. It was deficient from southern Louisiana and Florida north-eastward to Newfoundland. The greatest excesses were: Havre, 12.3; Swift Current and Helena, 12.2; Miles City, 12.1; Calgary, 11.9; Medicine Hat, 11.8. The largest deficits were: St. Johns, N. F., 5.4; Eastport, 4.9; Chatham and Columbia, S. C., 4.5; Albany and Augusta, 4.1; Northfield and New York, 3.7.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: North Dakota, 5.0; Missouri Valley, 6.1; northern Slope, 9.2; middle Slope, 6.2. The greatest negative departures were: New England, 2.8; middle Atlantic, 2.2; south Atlantic, 3.1.

The *years of highest and lowest mean temperatures* for December are shown in Table I of the REVIEW for December, 1894. The mean temperature for the current month was the highest on record at the following stations: Sacramento, 49.4; Fresno, 49.3; Port Angeles, 42.6; Rapid City, 37.8; Helena, 35.9; Baker City, 34.8; Miles City, 31.4. The mean temperature was the lowest on record at: Columbia, S. C., 44.0.

The *maximum and minimum temperatures* of the current month are given in Table I. The highest maxima were: 84, Los Angeles (3d); 83, Key West and Jupiter (9th), San Antonio (13th); 80, Tampa (8th), Corpus Christi (14th), Palestine (23d); 79, Shreveport (23d); 78, New Orleans (14th), Yuma (3d), San Diego (frequently). The lowest maxima were: 41, Moorhead (frequently), Sault Ste. Marie (11th), Idaho Falls (24th); 44, Huron (9th); 45, St. Paul (28th); 46, Duluth (10th), Bismarck (11th). The highest minima were: 58, Key West (17th); 46, San Diego (18th); 45, Point Reyes Light (7th); 44, Jupiter (23d). The lowest minima were: -27, Moorhead (1st); -26, Williston (2d); -23, Bismarck (2d); -22, Havre (2d); -21, Duluth (1st); -11, Huron and Miles City (2d); -10, Northfield (28th).

The *limits of minimum temperatures*, 32° and 40°, are shown by lines on Chart No. V.

The *years of highest maximum and lowest minimum temperatures* are given in the four last columns of Table I of the current REVIEW. During the present month the maximum temperatures were the highest on record at: Oklahoma, 75; Pueblo, 74. The minimum temperatures were not the lowest on record at any regular station of the Weather Bureau.

The *greatest daily range of temperature and the data for computing the extreme and mean monthly ranges* are given for each of the regular Weather Bureau stations in Table I. The largest values of the greatest daily ranges were: Pueblo, 50; Dodge City, Columbia, Mo., and Carson City, 43; Havre and El Paso, 42; San Luis Obispo and Fort Smith, 41; Hannibal, 40. The smallest values were: Pysht, 10; Tatoosh Island and Fort Canby, 11; Key West, 13; Pysht and Seattle, 16; Astoria and San Francisco, 17.

Among the *extreme monthly ranges* the largest were: Havre, 81; Rapid City, 73; Williston, 72; Bismarck, 69; Moorhead, 68; Duluth, 67; Miles City, 66; Pueblo, 64; Pierre and Sioux City, 63. The smallest were: Tatoosh Island, 17; Fort Canby, 21; Point Reyes Light and San Francisco, 22; Pysht, 24; Port Angeles, and Key West, 25.

The *accumulated monthly departures* from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column for comparison with the departures of current conditions of vegetation from the normal condition.

| Districts.                    | Accumulated departures. |          | Districts.             | Accumulated departures. |          |
|-------------------------------|-------------------------|----------|------------------------|-------------------------|----------|
|                               | Total.                  | Average. |                        | Total.                  | Average. |
|                               | °                       | °        |                        | °                       | °        |
| Middle Atlantic.....          | + 3.7                   | + 0.3    | New England.....       | - 1.1                   | - 0.1    |
| South Atlantic.....           | + 5.6                   | + 0.5    | Florida Peninsula..... | - 9.2                   | - 0.8    |
| East Gulf.....                | + 4.3                   | + 0.4    | North Dakota.....      | -11.5                   | - 1.0    |
| West Gulf.....                | -14.5                   | - 1.2    | North Pacific.....     | - 1.8                   | - 0.2    |
| Ohio Valley and Tenn.....     | -12.3                   | - 1.0    |                        |                         |          |
| Lower Lake.....               | + 7.5                   | + 0.6    |                        |                         |          |
| Upper Lake.....               | -18.6                   | - 1.6    |                        |                         |          |
| Upper Mississippi Valley..... | -16.9                   | - 1.4    |                        |                         |          |
| Missouri Valley.....          | -14.1                   | - 1.2    |                        |                         |          |
| Northern Slope.....           | + 2.4                   | + 0.2    |                        |                         |          |
| Middle Slope.....             | +24.8                   | + 2.1    |                        |                         |          |
| Abilene (southern Slope)..... | -26.3                   | - 2.2    |                        |                         |          |
| Southern Plateau.....         | +10.6                   | + 0.9    |                        |                         |          |
| Middle Plateau.....           | + 5.0                   | + 0.4    |                        |                         |          |
| Northern Plateau.....         | -15.0                   | - 1.2    |                        |                         |          |
| Middle Pacific.....           | + 0.6                   | + 0.0    |                        |                         |          |
| South Pacific.....            | + 6.0                   | + 0.5    |                        |                         |          |

## MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer; an evaporimeter may be so constructed as to give the *quantity* of water evaporated from a similar surface during any interval of time. Such an evaporimeter, therefore, would sum up or integrate the effects of those influences that determine the temperature as given by the wet bulb; from this quantity the *average humidity of the air* during any given interval of time may be deduced.

Measurements of evaporation within the thermometer shelters are difficult to make so as to be intercomparable at temperatures above and below freezing, and they may be replaced by computations based on the wet-bulb temperatures. The absolute amounts of evaporation from natural surfaces not protected from wind, rain, sunshine, and radiation are

being measured at a few experimental stations and will be discussed in special contributions.

*Sensible temperatures.*—The sensation of temperature experienced by the human body and ordinarily attributed to the condition of the atmosphere depends not merely on the temperature of the air, but also on its dryness, on the velocity of the wind, and on the suddenness of atmospheric changes, all combined with the physiological condition of the observer. A satisfactory expression for the relation between atmospheric conditions and nervous sensations has not yet been obtained.

#### PRECIPITATION.

[In inches and hundredths.]

The distribution of precipitation for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III. The total precipitation for the current month (from 9 to 30 inches) was heavy on the coasts of Washington, Oregon, and northern California; it was quite light over the rest of the United States, but was rather heavy (7.7) at St. Johns, N. F. The larger values at regular stations were: Pysht, 25.3; Tatoosh Island, 19.9; Astoria, 19.1; Fort Canby, 16.0.

Details as to excessive precipitation are given in Tables XII and XIII.

The years of greatest and least precipitation for December are given in the REVIEW for December, 1890. The precipitation for the current month was the greatest on record only at Astoria, 19.14. It was the least on record at: Lander, T.; Bismarck, 0.03; Miles City, 0.09; Lynchburg, 0.13; Chicago, 0.16; Fort Smith, 0.33; Baltimore, 0.37; Harrisburg, 0.40; Springfield, Mo., 0.79; Northfield, 0.81; Buffalo, 0.84; Sault Ste. Marie, and Knoxville, 0.95; Parkersburg and Narragansett Pier, 1.56.

The diurnal variation, as shown by tables of hourly means of the total precipitation, deduced from self-registering gauges kept at the regular stations of the Weather Bureau, is not now tabulated.

The current departures from the normal precipitation are given in Table I, which shows that precipitation was in excess in small portions of the South Atlantic and Florida coasts, northwestern Texas, southern Arizona and California, northern California and Washington. It was deficient over the greater part of the country, and especially in the central Gulf, Middle Atlantic and New England States.

The large excesses were: Astoria, 8.1; Fort Canby, 6.1; Tatoosh Island, 5.4; Savannah, 3.6. The large deficits were: Shreveport, 3.9; Little Rock, 3.8; Chattanooga, 3.7; Vicksburg and Memphis, 3.6.

The average departure for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: South Atlantic, 109; southern Slope (Abilene), 248; north Pacific, 134.

Normal: Northern Plateau, 100.

Below the normal: New England, 61; Middle Atlantic, 35; Florida Peninsula, 96; east Gulf, 54; west Gulf, 33; Ohio Valley and Tennessee, 40; lower Lake, 64; upper Lake, 42; North Dakota, 43; upper Mississippi, 36; Missouri Valley, 40; northern Slope, 22; middle Slope, 59; southern Plateau, 73; middle Plateau, 36; middle Pacific, 95; south Pacific, 69.

The total accumulated monthly departures from normal precipitation from January 1 to the end of the current month are given in the second column of the following table; the third column gives the percentage of the current accumulated precipitation relative to its normal value.

| Districts.                    | Accumulated departures. | Accumulated precipitation. | Districts.                | Accumulated departures. | Accumulated precipitation. |
|-------------------------------|-------------------------|----------------------------|---------------------------|-------------------------|----------------------------|
|                               | Inches.                 | Per ct.                    |                           | Inches.                 | Per ct.                    |
| North Dakota.....             | + 2.90                  | 115                        | New England.....          | — 5.00                  | 89                         |
| Upper Mississippi Valley..... | + 0.40                  | 101                        | Middle Atlantic.....      | — 7.30                  | 84                         |
| Missouri Valley.....          | + 0.30                  | 101                        | South Atlantic.....       | —10.70                  | 80                         |
| Northern Slope.....           | + 0.90                  | 106                        | Florida Peninsula.....    | — 4.00                  | 92                         |
| Middle Slope.....             | + 1.80                  | 109                        | East Gulf.....            | — 9.00                  | 84                         |
| Abilene (southern Slope)..... | + 2.30                  | 112                        | West Gulf.....            | —12.50                  | 71                         |
| Southern Plateau.....         | + 1.10                  | 113                        | Ohio Valley and Tenn..... | — 4.60                  | 90                         |
| Middle Plateau.....           | + 2.40                  | 120                        | Lower Lake.....           | — 2.10                  | 94                         |
| Northern Plateau.....         | + 1.10                  | 106                        | Upper Lake.....           | — 2.40                  | 93                         |
| North Pacific.....            | +10.10                  | 117                        | South Pacific.....        | — 1.80                  | 85                         |
| Middle Pacific.....           | + 3.90                  | 113                        |                           |                         |                            |

#### SNOWFALL.

The total monthly snowfall at each station is given in Table II; its geographical distribution is shown on Chart V. This chart also shows the isotherms of minimum 32° and of minimum 40° for the air within the ordinary thermometer shelter. The former isotherm is an approximate limit to possible snow, while the latter is an approximate southern limit to the regions that report frost in exposed localities.

Snowfalls of from 5 to 20 inches are reported from the Lake Region and New England; 5 to 15 inches in the interior of the South Atlantic States, which was quite phenomenal and did much damage by the breaking of trees and telegraph lines; snowfalls of 10 to 40 inches were reported from the Sierra Nevada, but only from 5 to 15 from the Rocky Mountain region. A maximum snowfall of 64 inches was reported from Cascade Tunnel, Wash.

The depth of snow on the ground at the end of the month is given in detail in Table II, and for the winter months is also shown on Chart VI; it is also shown on the weekly charts of the Climate and Crop Service, published by the Weather Bureau during December to March, inclusive.

In general, at the close of the month, there was about 10 inches of snow on the ground in eastern Connecticut and southeastern Massachusetts, whence it diminished to a "trace" in central Pennsylvania and New York and southern Maine, New Hampshire, and Vermont. There was also about 10 inches in the northern peninsula of Michigan and 10 or 15 in central Minnesota and eastern portions of North and South Dakota; from 10 to 20 inches were reported at mountain stations in Colorado and 10 to 40 at stations in the Sierra Nevada.

#### ICE.

The thickness of ice in the rivers and harbors is shown in detail in the bulletins published every Monday by the Weather Bureau, the more prominent characteristic data for the beginning and end of the month are as follows: Iowa, Sioux City, 8 and 6 inches. Maine, Eastport, 3.5 and 12; Lewiston, 1.5 and 12.0. Minnesota, Moorhead, 15 and 19.5; St. Paul, 10 and 13. Nebraska, Valentine, 14 and 14.0. North Dakota, Bismarck, 8.5 and 21; Williston, 16 and 16.0. South Dakota, Yankton, 12 and 12.0. Wisconsin, Green Bay, 4.5 and 5.0. At the close of the month the Missouri and upper Mississippi were not frozen so far south as on the corresponding date of 1895, but the ice was thicker at some of the more northerly stations. During the middle and close of the month considerable ice existed in the rivers of New England and New York.

*Snow and ice in Canada.*—On the December Weather Map of the Canadian Service, Mr. R. F. Stupart says:

On Vancouver Island and in British Columbia the rainfall, as in November, has again been very much above the average generally. At Esquimaux 10.4 inches fell, which is 3.0 inches above the average. Agassiz recorded 10.0 inches. In the Northwest Territories and Manitoba, where the precipitation was almost entirely if not altogether in the form of snow, the amount was small and in most localities below average. The Lake Superior district shows a marked deficiency in pre-